can be treated. But even this is hardly necessary if the application to the skin is in the liquid form; for with a powerful spraying machine, as many as one hundred cattle have been completely covered in the space of an hour.

Of pastes and powders and fluids recommended there is no end; and it will serve no useful purpose to give detailed lists discussing the merits of each. The points to be kept in view are that the liquid should be of an oily and non-poisonous nature, capable of clogging up the air-pores of the ticks. It should be cheap, and easily applicable without handling the cattle; it should, finally, not easily evaporate, or be washed off by the rains. A full discussion of remedies has recently been published by me, the following being taken from the summary at the end: "A number of types of washes for spraying are selected for description. All poisonous ones should be rejected, as there are non-poisonous preparations equally effective. Carbolic acid dips and other liquids, which evaporate quickly, need frequent applications, and should be discarded in favour of oily liquids or emulsions where the latter are equally effective. The best of all these is the kerosene emulsion regularly used for plants. There are many formulæ for the preparation of this; a useful one (for ticks) is given." The formula referred to is as follows: "In two quarts of boiling water dissolve half a pound of soap; remove from fire; immediately add one pint of kerosene, and agitate. In from three to five minutes the liquid becomes creamy. It may be stored in this form in bottles or barrels. For use, add three of water to one of emulsion; mix thoroughly, and apply with a spraying pump."[1]

The third and most important class of remedies is closely connected with the nutrition of the animal. If we can render the skin or blood of our cattle so distasteful to the tick that the latter will not attach itself, we have a solution of the whole matter. We should confer immunity upon our animals, and, at one stroke, do away with the necessity of all the laborious and expensive methods now in vogue for the destruction of these parasites.

The first step in this direction has been taken; and, in various parts of the world, most excellent results are recorded from the addition of small doses of sulphur to the animal's food.

It has already been noted that the food of animals has an influence upon their infestation by ticks. Cases are not uncommon among cattle-breeders where a mere change of pasture will cause all the ticks to drop off. This change is obviously felt through the animal's skin.

It has also been mentioned that the ticks seem to congregate upon cattle in poor condition, while those with sleek skins are more or less untouched. Dr. Cooper Curtice (late of the United States Bureau of Animal Industry) suggests, as an explanation of this, that there is in well-fed cattle an oily condition of the skin obnoxious to the ticks; and this suggestion is the more worthy of consideration when we remember the aversion of these creatures to grease of any kind.

It is certain that *sulphur taken internally* will render the skin evil-smelling, by the exhalation of sulphuretted hydrogen, a substance highly obnoxious to all parasites. The following seem to be the physiological changes which take place during the passage of the sulphur through the animal's body to the skin. Sulphur taken in with the food passes the stomach unaltered. In the intestines a small portion is changed into sulphides of hydrogen and the alkalies. Part of these sulphides pass into the blood, and into the tissues from the blood, and act chiefly upon the central nervous system. The sulphides in the tissues are variously excreted. By the kidneys they are excreted as sulphates; if in excess, part is also excreted in the form of sulphides. By the skin they escape as sulphides, giving the characteristic foul odour to the perspiration, and somewhat increasing its amount.

The doses of sulphur should be small, but they should be constant. The form in which the medicine is offered to the animals will best be decided by the manager of the estate. With stall-fed cattle there can be no difficulty at all; but with the cattle of large estates, which are seldom handled and sometimes not seen for long periods, it will be necessary to prepare the sulphur with salt as a "lick," to which cattle will readily help themselves if it is scattered about.

The success of this sulphur treatment has so far been encouraging, both at the Cape of Good Hope and in the United States. Doubtless with continued study other similar preventive remedies will from time to time be discovered, and thus rid the stockowners of the tropics of one of their most dreaded enemies.

C. A. BARBER.

NOTES.

PROF. HUXLEY's health is at present a source of great anxiety to his friends. Symptoms of renal insufficiency appeared last week, and this, with the other complications which have attended his protracted illness, has made his condition a very critical one, but we are glad to learn that it is improving.

WE deeply regret to notice the announcement of the death of Dr. W. C. Williamson, Emeritus Professor of Botany in Owens College, Manchester. Dr. Williamson was elected into the Royal Society in 1854.

PROF. VERNEUIL, the eminent French surgeon, and Member of the Paris Academy of Sciences, died on June 12.

PROF. SIMON NEWCOMB has been elected Associé étranger of the Paris Academy of Sciences, in succession to the late von Helmholtz.

PROF. W. PETERSON, Principal of the University College, Dundee, has accepted the position of Principal of McGill University, Montreal, in succession to Sir William Dawson.

SIR E. MAUNDE THOMPSON, principal librarian of the British Museum, has been elected a Corresponding Member of the Philosophico-historical Section of the Berlin Academy of Sciences.

THE University of Pennsylvania has received gifts, within a few days, aggregating nearly a million dollars. This includes half a million dollars from Provost Harrison, already noted in these columns. Scarcely a week passes without our being able to record similar gifts from private benefactors to the universities and colleges of the United States. *Science* reports that Dr. D. K. Pearson has offered £10,000 to Mount Holyoke College if an additional £30,000 can be raised. It is said that Dr. Pearson has already given £400,000 to various colleges.

THE death is announced of Dr. A. Eliseief, known for his explorations and anthropological work.

THE St. Petersburg correspondent of the *Lancet* reports that the Emperor of Russia has appointed a committee to organise the collection of subscriptions for the monument which the Institute of France propose to erect to Lavoisier.

THE trustees of Columbia College decided, a few days ago, to grant the Barnard Medal to Lord Rayleigh and Prof. Ramsay jointly for their discovery of argon. Only Lord Rayleigh's name was mentioned in the previous announcement of the award.

DR. BACKLUND has been elected a Correspondant of the Paris Academy, in the Section of Astronomy, in the place of the late

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[1] For further details, see papers in Leeward Islands *Agricultural Journal*, Nos. 1-3.

M. Wolf; and Prof. Kowalewsky has been elected to fill the late M. Cotteau's place as Correspondant in the Section of Anatomy and Zoology.

The French Association for the Advancement of Science will meet at Bordeaux, from August 4 to August 9, under the presidency of M. E. Trélat. Applications for membership should be addressed to the Secretary of the Association, 28 rue Serpente, Paris.

The third international meeting of Psychologists will be held at Munich from August 4 to 7. The first meeting was held at Paris in 1889, and the second in London in 1892 Prof. Stumpf, of Berlin, will act as President, and Dr. von Schrenck-Notzing, of Munich, as General Secretary.

The second Italian Geographical Congress will be held in Rome next September, under the patronage of the King of Italy and the Duke of Genoa. The President of the Congress will be Marquis G. Doria, President of the Societá Geographica Italiana. The Secretary is Prof. D. Vinciguerra, and his address is Via del Plebiscito, 102, Roma.

Dr. T. G. Brodie has succeeded Prof. C. S. Sherrington, F.R.S., as Lecturer on Physiology at St. Thomas's Hospital.

Prof. E. Hering, of Prague, has been proposed as successor of the late Carl Ludwig in the chair of Physiology at Leipzig.

Prof. E. Mach, of Prague, well known by his book on Mechanics, and by his experimental researches on Physics, has been appointed Professor of Philosophy at the Vienna University. Vienna will, therefore, be the first place where Philosophy will be taught on a modern and scientific basis.

The Cracow Academy of Sciences offers prizes of 1000 and 500 florins for the best discussion of theories referring to the physical condition of the earth, and for the advancement of an important point connected with the subject. Memoirs must be sent in before the end of 1898.

The International Conference on the Protection of Wild Birds met at Paris on Tuesday, under the presidency of M. Gadaud, Minister of Agriculture. England was represented by Sir Herbert Maxwell, Mr. Howard Saunders, and Mr. F. Harford, of the British Embassy at Paris. Belgium, Holland, Germany, Russia, Austria-Hungary, Luxemburg, Switzerland, Italy, Greece, and Spain have also sent delegates. The conference meets as the result of a resolution passed at the International Agricultural Congress held at the Hague in 1891.

At the recent annual meeting of the Royal Society of Canada, the following officers (says *Science*) were elected for the ensuing year:—President, Dr. R. S. C. Selwyn, C.M.G., F.R.S.; Vice-President, the Archbishop of Halifax, Dr. O'Brien; Secretary, Dr. J. G. Bourinot, C.M.G.; Treasurer, Prof. J. Fletcher. Prof. Bovey, Dean of the Faculty of Applied Science, McGill University, was chosen President of the Section of Mathematical, Physical, and Chemical Sciences, Prof. Dupuis, Vice-President, and Captain E. Deville, Surveyor-General of the Dominion, Secretary. In the Section of Geological and Biological Sciences the following choice was made:—President, Prof. Wesley Mills; Vice-President, Prof. Penhallow; Secretary, Dr. Burgess.

At the annual general meeting of the Numismatic Society of London, held on Thursday last, Sir John Evans, President, in the chair, the silver medal of the Society was awarded to Prof. Theodor Mommsen, for his distinguished service to the science of Numismatics. Dr. Barclay Head, keeper of coins in the British Museum, in returning thanks on behalf of Prof. Mommsen, drew attention to the fact that quite recently Mommsen had handed over to the Royal Academy of Sciences of Berlin the sum of 25,000 marks, presented to him as a testimonial from his disciples in all countries on the occasion of the jubilee of his Doctorate, with directions that it should be devoted to the compilation and publication, under the auspices of the Academy, of a complete *corpus* of all known extant Greek coins.

Few neighbourhoods offer more features and objects of interest than the district around Galway. An excursion to this district, arranged by the Irish Field Club Union, will therefore probably be a very successful one. The country west of Galway presents the geologist with a great variety of rocks and rock structures. Some of the most interesting studies in Ethnography afforded in the British Isles may there be found, and the antiquarian and archæologist are offered exceptional attractions. The party will meet at Galway on Thursday, July 11, and will stay in the neighbourhood until the following Wednesday. The places to be visited are: The Twelve Bens, Connemara, Ballyvaughan and the Burren district, the Aran Islands, Oughterard and Lough Corrie. A programme, containing notes on the topography, geology, botany, zoology, ethnography, and archæology of these places has been prepared. During the reunion, a conference will be held for the consideration and discussion of matters relating to the advancement and extension of Field Club work in Ireland. The Secretary of the Union is Mr. R. Lloyd Praegar, National Library, Dublin.

It has long been known in a general way that the time required for hatching out the eggs of cold-blooded animals is dependent on the temperature at which they are kept; and that in the case of birds "the period of incubation is much related to the size of the bird." Mr. A. Sutherland (Roy. Soc. of Victoria, December 1894) has recently made some observations on the relations between hatching-time and temperature, and formulates a law based upon his results. He has further investigated incubation among birds and gestation. Birds and mammals keep at a practically constant temperature—between 37° C. and 43° C.; and it may be assumed that sitting birds keep their eggs at a tolerably definite temperature. Why then should the period of incubation or gestation vary so much? Mr. Sutherland asserts that the time of incubation or gestation, as the case may be, has a certain definite relation to the weight of an animal. He states the two laws he has arrived at in the following words:—(1) "For animals of the same size the time of embryo development is inversely proportional to the square of the temperature, that temperature being reckoned from a definite point." (2) "At the same temperature, the period of development is directly proportional to the sixth root of the weight of the mature animal."

A few months ago, M. de Montessus published an interesting paper on the frequency of earthquakes, of which a summary is given in a previous note (vol. li. p. 540). This he has followed up by another paper of still greater value on the relation between seismic frequency and the relief of the ground (*Comptes rendus*, vol. cxx. pp. 1183-1186). The following are the general conclusions at which he has arrived from a study of 348 regions, in which 9700 earthquakes and 5000 volcanic eruptions are known to have occurred. In a group of adjoining districts, the most unstable are those which present the greatest differences of relief, *i.e.* those whose average slope is greatest. The unstable regions follow the great lines of folding of the earth's crust. Mountainous countries are generally more unstable than flat ones, and, in any one mountain-chain, the short and steep slope is the more unstable of the two, especially in its steepest parts. Coast regions with a rapidly deepening sea are unstable, especially if bordered by an important mountain-chain; those with a slightly sloping sea-bed are stable, especially if they adjoin a flat country. Lastly, in regions which are frequently disturbed by earthquakes, and which at the same time possess very active volcanoes, the seismic frequency and volcanicity are independent. It follows, therefore, that earthquakes are a purely geological phenomenon, and probably have their origin in the same dynamical forces to which the present relief of the earth's crust is due.

RADIOLARIAN earth of Tertiary age has long been familiar from Barbados: in a recent number of the *Bull. Museum Comp. Zool.* (Harvard), Mr. R. T. Hill records it from the island of Cuba. It occurs at one place only, near Baracoa, where it is over 500 feet in thickness and is well stratified, the strata being vertical. The rock is chalky in appearance, with occasional thin separation-layers of a grey-blue clay, and some flint-like siliceous nodules: sponge-spicules and echinoid fragments were found in it, but no diatoms It appears to lie below certain yellow beds identified as Miocene. The paper contains much other information on the geology of Cuba, and the origin of the circular harbours of the north coast is dealt with. The author finds no evidence of any movement of depression in the island since the beginning of Tertiary times.

DR. F. KLENGEL, of Leipzig, has sent us a copy of his paper, read some time since before the Bohemian Society of Sciences, on the non-periodical variations of temperature in the district of the Pic du Midi and Puy de Dôme, compared with those at St. Bernard, for which station a longer series of observations is available. The problem undertaken by the author was mainly to show how far the irregular variations of temperature in these three widely separated and high regions of Central Europe agreed together. The most important conclusions drawn from various tables are, that a remarkable agreement is shown in the non-periodical changes at the mountain stations, whereas in the plains the variations differ materially from each other. The influence of the sea is visible in the lower region of of the Pic du Midi, but at the higher level it entirely disappears.

THE papers in the June *Journal* of the Royal Microscopical Society include one on British patents taken out in connection with the microscope, between 1666 and 1800.

THE Department of Mines ot Victoria has issued a report on the Victorian coalfields, the development of which is proceeding rapidly. Evidence is given to show that the coal is of drifted origin: among other points, the mixture of conifers and ferns in the flora can only be explained by transport before deposition.

MR. JOHN TEBBUTT has sent us a report of the work done at his observatory, Windsor, New South Wales, during 1894. Meteorological observations have now been made at the observatory for thirty-two years. Among the astronomical work of last year were observations of lunar occultations of stars, of southern comets, and of double stars.

THE sixty-first annual report of the Natural History, Literary, and Polytechnic Society of York School gives evidence of enthusiastic work in many branches of science. Few school societies of a similar kind can boast of reports running into the sixties. With this report we received the *Natural History Journal* and *School Reporter* for June 15, conducted by the societies in Friends' schools. The journal contains articles on Southern Tyrol and on the planet Mars, as well as notes, and records of observations of scientific interest.

Bulletin No. 48 of the U.S. National Museum is devoted to "A Revision of the Deltoid Moths," by Prof. John B. Smith, the paper being a contribution towards a monograph of the insects of the Lepidopterous family Noctuidæ of Boreal North America. Fourteen plates, showing the different species of these Noctuids, and the structural characters of the Heliini, Herminiini, and Hypenini, accompany the descriptive text. The genera Pseudorygia and Rivula are not included in the series, Prof. Smith being of the opinion that they do not possess real Deltoid characteristics.

THE Report of the Geological Survey of Canada for 1894 describes the results of geological expeditions in the Labrador Peninsula and west of Hudson Bay. In consequence of lack of money it was found necessary to reduce the number of parties working in the field, while there is an accumulation of material awaiting publication. A deep boring for petroleum has been begun at Athabasca Landing, but at a depth of 1011 feet the oil had not been reached; all indications, however, point to the existence of great quantities of petroleum in the Devonian strata which immediately underlie the Cretaceous.

THE Central Physical Observatory of St. Petersburg has made an important addition to its comprehensive *Monthly Weather Report* by showing on a chart the deviations of temperature and rainfall of the month from the normal conditions. To arrive at this, M. Wild states that the values have been calculated for no less than 322 stations, all of which are represented in the report. The excess or defect of temperature at each place is shown on the chart by drawing curves through those places where the deviation is equal in amount, while the deviation of rainfall is represented by red and blue tints. The work is very neatly executed, and shows clearly, at a glance, the climatic conditions of the month.

THE 1895 *Photography Annual*, edited by Mr. Henry Sturmey, is an invaluable compendium of photographic information, and a useful record of the progress made during last year in the various branches of the science and practice of photography. In it Mr. C. H. Bothamley traces the advances of photographic chemistry; Mr. Chapman Jones describes the work done in the field of photographic optics; Mr. T. Bolas records the progress made in photo-mechanical printing; Captain Abney writes on spectrum photography; and Mr. Albert Taylor contributes a very full account of what was done in astronomical photography during 1894. These records, together with descriptions of new photographic apparatus and materials, technical articles, and particulars of photographic societies throughout the United Kingdom, render the *Annual* indispensable to all who take an intelligent interest in photography. The publishers are Messrs. Iliffe and Son.

THE current number of the *Comptes rendus* contains an account, by M. Berthelot, of a new combination of argon. Following up his researches on argon, this author has discovered that free nitrogen, prepared pure from nitrites, can be caused to enter into combination with the elements of carbon disulphide when subjected to the spark or silent discharge after saturation with disulphide vapour. The resulting compound contains some mercury sulphocyanide, and does not regenerate nitrogen under the action of heat or of concentrated sulphuric acid. When argon is employed in place of nitrogen, a similar reaction appears to take place. Under the continued action of the silent discharge, a sample of 6·55 c.c. of argon, as pure as it could possibly be obtained, saturated with carbon disulphide vapour at 20° C., and confined in the reaction tube by mercury, gave a continuous absorption which appeared to go on indefinitely. The product contained mercury, but gave no reaction for sulphocyanide. When heated, a quantity of gas was recovered equal to about one half the volume absorbed, and this recovered gas was proved to be argon by condensation with benzene, and production of the remarkable fluorescence previously described. Though this work has been done on such small quantities of material that an exhaustive examination of the product was not possible, M. Berthelot believes that he has satisfactorily demonstrated the significant property of argon, that it can enter into combination and be regenerated from its compound or compounds with its initial properties intact.

As a result of observations carried on by the *Investigator* in the autumns of 1892–3–4, Commander C. F. Oldham, R.N., contributes two papers on the Laccadive Islands to the *Journal of the Asiatic Society of Bengal* (vol. lxiv. pt. ii. No. 1, April 1895). The group consists of four submerged coral-reefs, six reefs with small islets ("sand-cays"), and eight inhabited atolls: three of the reefs and five of the atolls were examined. The islands and sand-cays occur, in all cases but one, on the eastern side of the atolls; they cannot, therefore, have been built up by the action of the ordinary monsoon winds which blow mainly from the west, but must be due to the occasional hurricanes which reach the eastern and north-eastern sides of the atolls. The effect of the tides and currents is seen in the more vigorous growth of the atolls to the south and west. The islands and islets are extending at their extremities, and in some cases are being added to on the south-western sides where they face the lagoon. No evidence of either elevation or subsidence was observed.

The additions to the Zoological Society's Gardens during the past week include a Rhesus Monkey (*Macacus rhesus*, ♀) from India, presented by Mrs. Stevens; two Javan Parrakeets (*Palæornis javanica*) from Java, presented by Lieut.-General Sir H. B. Lumsden; a Green-winged Trumpeter (*Psophia viridis*) from Brazil, presented by Mr. H. A. Astlett; a Diamond Snake (*Morelia spilotes*) from Australia, presented by Mr. M. Mitchener; a Natal Python (*Python natalensis*) from South Africa, presented by Mr. William Norman; a Korin Gazelle (*Gazella rufifrons*, ♀) from Senegambia, a Blue and Yellow Macaw (*Ara ararauna*) from South America, a Naked-necked Iguana (*Iguana delicatissima*) from Tropical America, thirty-four Black Salamanders (*Salamandra atra*), South European, deposited; a Tachiro Goshawk (*Astur tachiro*) from South Africa, nine Red-beaked Weaver-Birds (*Quelea sanguinirostris*) from West Africa, purchased; a White-crested Jay Thrush (*Garrulax leucolophus*), a Striated Jay Thrush (*Grammatoptila striata*) from India, received in exchange; a Burrhel Wild Sheep (*Ovis burrhel*, ♀), a Patagonian Cavy (*Dolichotis patachonica*), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

The Yerkes Observatory.—From a note in the *Astrophysical Journal* for June, we learn that the construction of the buildings of the Yerkes Observatory is advancing rapidly, and it is hoped the 40-inch refractor will be ready for use in September or October. The Observatory is situated on the shores of Lake Geneva, Wisconsin, at an elevation of 180 feet above the lake, and is about seventy-five miles from Chicago. The dome for the great telescope, which is being built by Warner and Swasey, is 90 feet in diameter, with a shutter opening 12 feet; the rising floor is 75 feet in diameter, and will have a vertical movement of 22 feet. The motive power for turning the dome and elevating the floor of the Observatory will be supplied by electro-motors.

In addition to the large telescope, provision is made for the use of the 12-inch telescope now at the Kenwood Observatory, and another telescope of 16 inches aperture. The meridian room is designed to accommodate a large meridian circle, but, in the first instance, a transit instrument will be employed.

The Observatory buildings appear to be designed on a very liberal scale, and comprise offices, library, lecture theatre, spectroscopic, physical, chemical, photographic, and other laboratories. We understand that Prof. Barnard and Prof. Burnham have accepted positions in the Observatory.

The Granulation of the Sun's Surface.—The granular or mottled appearance of the surface of the sun is familiar to all observers, and the great resemblance to terrestrial cirrus clouds has long been recognised. A possible cause of this appearance has been recently suggested by Dr. Scheiner (*Astr. Nach.* 3279), the idea being that Helmholtz's investigations on the formation of waves in our own atmosphere apply also in the case of the sun. According to Helmholtz, air waves are produced when two strata of air of different temperature and density glide over each other; if the lower layer is nearly saturated with aqueous vapour, the wave crests will be centres of condensation, in consequence of diminished pressure, and will appear as clouds, while the depressions will form transparent interspaces. On this theory a "mackerel sky" is produced when two series of waves cross each other. Dr. Scheiner points out that somewhat similar conditions prevail in the sun; there are layers of different temperature, and currents in various directions in these layers, and in the photosphere the condensable gases are in an over-saturated state. He therefore considers that the bright grains of the photosphere are wave-crests of two crossing systems of waves, rendered visible by an increase of condensation. In the case of the sun, the observed lengths of the waves—that is, the distance between the separate grains—is from 1000 to 3000 kilometres, and it is believed that waves of this magnitude might be produced without the assumption of extraordinary velocities.

Assuming this to be a true explanation, the photosphere must be a very thin layer; and since the granules are of about the same size in all parts of the surface, the velocity of the currents must be nearly equal in all heliocentric latitudes.

The Satellites of Jupiter.—Not contented with his brilliant discovery of a fifth satellite to Jupiter, Prof. Barnard has been employing the great resources of the Lick telescope in further investigations of the satellites which were discovered by Galileo (*Monthly Notices*, *R.A.S.*, vol. lv. p. 332). One part of his work has consisted of micrometric measurements of the diameters of the satellites, and the results, reduced to a mean distance of the planet from the sun equal to 5·20, are as follows:

	Angular diameter. ″	Diameter in miles.
Satellite I.	1·048	2452
,, II.	0·874	2045
,, III.	1·521	3558
,, IV.	1·430	3345

It is pointed out that these values are in good accordance with the mean values derived from nine sets of measures made by as many different observers since 1829. Of the earlier estimations, those made by Schroeter in 1798 agree most closely with modern results.

Special attention appears to have been given by Prof. Barnard to Satellite I., on which he discovered, with the 12-inch equatorial, on September 8, 1890, the existence of a bright equatorial belt and dark polar caps. These appearances have been verified at every favourable opportunity, and "they are, beyond question, permanent features of the satellite, and will always be visible when a favourable transit occurs." These markings on the satellite fully account for all the phenomena which have been reported of the distortion or ellipticity of its disc, as well as for the apparent doubling of the satellite during some transits. When the satellite is transiting over a dark part of the planet, the white belt appears very prominently, while the dark poles are correspondingly difficult to see, so that, without very close attention, the satellite looks like a thin white strip. If, on the other hand, it be transiting across a bright part of the planet, the white belt is lost in the bright background, and the polar regions appear as two separate dark spots, making the satellite appear double. The dark polar caps are darkest at the poles, and become rapidly less intense towards the equator. Prof. Barnard considers that the phenomena observed on this satellite indicate that its physical condition is similar to that of Jupiter.